**Probability and the Punnett Square**

**Lesson Plan by Mary Ann Dickey**

**Marsh Grammar School Grade 8**

*Note: This lesson is adapted from the lab “Make the Right Call!” on pages 90-91 of the textbook Cells and Heredity, Prentice Hall, 2007.*

**NGSS Standard: MS-LS3-4(MA). Develop and use a model to show that in sexually reproducing organisms individuals have two of each chromosome, and hence two alleles of each gene, one acquired (randomly) from each parent.**

Objective: Students will use a probability activity to support the predictions made with a Punnett square of crossing two heterozygous traits. (Each parent has one dominant and one recessive trait.)

Introduction: Students will read the section of text 3-1 and 3-2 for the concepts of traits, dominance, recessive, heredity, Punnett squares and probability.

Question: Does the mathematical prediction of probability always come true? (Concept: probability does not always assure a specific outcome, but the more data given, the more closely the data will reflect the probability.

Procedure:

1. Give students the lab handout with the directions and data tables.
2. Give students the materials – two paper bags labeled A & B, two blue marbles and two white marbles (one of each color placed in each bag.)
3. Students will first complete part A of the worksheet – the Punnett square based on the heterozygous traits (Bb & Bb)
4. Students will use the Punnet Square to predict the outcome of the offspring. (25% white, 75% blue)
5. Students will work in pairs to draw one marble from each bag and record the results in the data table.
6. Students will then upload their data (manually) into the iSense project.
7. Students will manipulate the data and visualizations to find the best graph that represents how their data reflects the predictions of the Punnett square.
8. Students will answer the given questions.

Assessment: The lab sheet will be turned in, as well as the print out of one representative visualization, for a lab grade.

**Probability and the Punnett Square**

Directions: You are going to investigate the difference between the predicted outcomes of a Punnett square and the actual outcomes of crossing two heterozygous traits.

1. The Punnett Square: Complete the following Punnett Square and then calculate the percentage of outcomes for each of the offspring.

|  |  |
| --- | --- |
|  |  |
|  |  |

1. Actual Occurrence:
2. Draw one marble out of bag 1 and record the color below. Put it back. Draw one marble out of bag 2 and record the color. Put it back. Repeat these steps for a total of 12 times.
3. Complete the column for Outcomes – ONE or BOTH of the draws is a blue marble, write “blue” in the outcome column. If ONE or BOTH of the draws is a white marble, write “white” in the outcome column.

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | Bag 1 | Bag 2 | Outcome |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |
| 11 |  |  |  |
| 12 |  |  |  |

1. iSense Project
   1. Open [www.isenseproject.org](http://www.isenseproject.org)
   2. Search for project “Probability and Genetics” or project 1393.
   3. The contributor key is dickey251